

REMARKS

Claims 1, 2, and 6-8 are pending in this application. Applicants respectfully request reconsideration of the pending claims.

I. Interviews

The courtesies extended to Applicant's representative by Examiner Zhu at the interviews held October 22, 2008 and November 6, 2008, are appreciated. The reasons presented at the interviews as warranting favorable action are incorporated into the remarks below, which constitute Applicants' record of the interviews.

II. Rejections Under 35 U.S.C. §103(a)

Claims 1, 2 and 6-8 were rejected under 35 U.S.C. §103(a) as allegedly being obvious over JP 2000-001765 ("JP 765") in view of U.S. Patent No. 5,580,397 ("Meyer"). Applicants respectfully traverse this rejection.

Specifically, the Patent Office alleged that it would have been obvious to have adjusted the acetylene to ethylene ratio of 0.428 described in JP 765 to be at least 0.55. Moreover, the Patent Office alleged that the ratio is allegedly a result-effective variable wherein the acetylene to ethylene ratio would allegedly have directly affected the surface carbon concentration, the carbon concentration gradient, microstructures, soot generation and the cost of the carburizing process, and thus one allegedly would have known to have adjusted the ratio in locating desired results for these properties. See Office Action, page 3 (citing JP 765, paragraphs [0025] and [0026]). Applicants respectfully disagree.

Applicants previously submitted a second Rule 132 Declaration ("Second Declaration") providing evidence that the ratio of acetylene to ethylene (i.e., 0.55 to 2.0) recited in claim 1 generated unexpected results in hydrocarbon decomposition and the amount of soot and tar by-product remaining of the surface of the steel charge after carburization.

However, the Patent Office found the Second Declaration unconvincing, and alleged that the evidence the provided in the Second Declaration failed to establish unexpected results because (1) the Second Declaration used the amount of hydrogen as a qualitative factor, (2) the different ethylene flow rates in Experiments 1 and 2 allegedly introduced another variable besides the acetylene to ethylene ratio, (3) the EDS analyses were performed on small random areas of the steel sample surface and were thus allegedly not representative of the results across the entire steel sample and (4) the lower hydrocarbon decomposition illustrated in Experiment 2 during the initial 12 minutes could have allegedly been resolved by a longer boost time.

At the interview on October 22, Examiner Zhu stated that the present rejection would most likely be withdrawn if Applicants submitted evidence demonstrating that an acetylene/ethylene ratio of 0.428 (i.e., the ratio in JP 765) and an acetylene/ethylene ratio of 0.55 (i.e., lower end of the ratio in the present claims) provides unexpectedly different results. Specifically, Examiner Zhu posed three recommendations to Applicants' representative.

First, Examiner Zhu recommended to conduct an additional experimental trial that is similar to Experiment 1 of Second Declaration (i.e., an experimental trial with an ethylene flow rate of 61.4 L/hr as in Experiment 1) and only manipulating the acetylene flow rate (i.e., an acetylene flow rate of 26.28 L/hr) in order to keep the acetylene to ethylene ratio of 0.428. Second, Examiner Zhu recommended to measure the final carbon content on the surface of the steel charge after carburization, instead of the hydrogen content in the exhaust stream. Finally, Examiner Zhu suggested that Applicants include a measurement that quantitatively defines the amount of soot on the surface of the charge after carburization.

In accordance with Examiner Zhu's recommendations, attached hereto is a third Rule 132 Declaration ("Third Declaration"), demonstrating that the presently claimed acetylene to ethylene gas mixture for the under-pressure carburizing of steel achieves unexpectedly

improved hydrocarbon (i.e., acetylene and ethylene) decomposition together with a more efficient carbon transfer from a gaseous phase to steel, even at the lower end of the acetylene to ethylene ratio recited in claim 1 (0.55), in comparison to an acetylene to ethylene ratio 0.428 (the ratio disclosed in JP 765).

Specifically, as shown in Table 2 of the Third Declaration, the carbon transfer efficiency in Experiment A (0.55 acetylene to ethylene ratio) was approximately 26.9%, while the carbon transfer efficiency in Experiments B and C (0.428 acetylene to ethylene ratio) was 6.7% and 18.2%, respectively. As such, Experiment A increased the carbon transfer efficiency over 300% from Experiment B and over 45% from Experiment C. Moreover, as shown in Table 3, the charge produced in Experiment A (0.65 g) displayed a 61.8% and 30.1% decrease in the carbon of carbon by-products (i.e., soot and tar) as compared to the charges produced by Experiment B (1.70 g) and Experiment C (0.93 g), respectively.

Furthermore, as shown in Table 5 of the Third Declaration, the case depth for the charge for Experiment A (0.55 acetylene to ethylene ratio) increased at least by 47.2% when compared to the charge for Experiment B (0.428 acetylene to ethylene ratio). Furthermore, the case depth for the charge for Experiment A increased at least by 13.5% when compared to the charge for Experiment C (0.428 acetylene to ethylene ratio).

As such, the present claims employing an acetylene to ethylene ratio of 0.55 to 2.0 cannot be considered to have been obvious from JP 765, at least because the Third Declaration conclusively demonstrates that the recited range of acetylene to ethylene provides unexpectedly improved properties.

Furthermore, Meyer does not remedy the deficiencies of JP 765. Meyer, at best, describes that hydrogen and nitrogen gases may be included in a gas carburizing mixture. See Meyer, col. 1, lines 51-53. However, Meyer does not rebut the showing of unexpected results in the Third Declaration. of hydrogen gas as the third component along with an acetylene to

ethylene mixture at a ratio of 0.55 of a hydrocarbon gas mixture unexpectedly improves hydrocarbon decomposition.

Applicants thus submit that the unexpected results and criticality achieved by a three-component hydrogen gas mixture for the under pressure carburizing of steel with an acetylene to ethylene ratio of 0.55 to 2.0 demonstrate that JP 765 alone, or in combination with Meyer, does not describe the claimed subject matter.

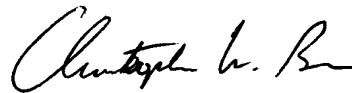
Reconsideration and withdrawal of the rejection are thus respectfully requested.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1, 2, and 6-8 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Date: November 10, 2008

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